



# LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 5 | Technical Appendices

CFA12 | Waddesdon and Quainton

**Data appendix (LQ-001-012)**

Land quality

November 2013

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# Department for Transport

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# 1 Introduction

1.1.1 The land quality appendix for the Waddesdon and Quainton community forum area (CFA12) comprises:

- a summary of engagement undertaken (Section 2);
- detailed risk assessment (Section 3);
- inspection notes and other site data (Section 4);
- geological sites of special scientific interest (SSSI) and local geological sites (LGS) (Section 5); and
- mining and minerals data (Section 6).

1.1.2 Maps referred to throughout the land quality appendix are contained in Maps LQ-01-025 to LQ-01-028 Volume 5, Land Quality Map Book.

## 2 Engagement

2.1.1 Table 1 sets out the local authorities and other organisations that have been engaged with during the preparation of the land quality section of the environmental impact assessment (EIA) for this study area, the types of information that have been provided to the assessment team and any specific concerns of those with whom the team engaged.

Table 1: Engagement on land quality issues undertaken for the Waddesdon and Quainton study area

<b>Local authority or other organisation</b>	<b>Method/dates of contact</b>	<b>Information provided and/or specific concerns</b>
Aylesbury Vale District Council  (AVDC)	Contact via email on:  28 November 2012; 10 December 2012; and 8 February 2013.  Contact via telephone on:  6 February 2013.	AVDC supplied the requested data regarding locations of potentially contaminated land within 1km of the route in a geographical information system (GIS) shapefile format.
Buckinghamshire County Council  (BuCC)	Contact via email on:  28 November 2012; 3 December 2012; 21 December 2012; 2 January 2013; 23 January 2013; 1 February 2013; 9 February 2013; and 2 May 2013.	Initial email regarding detailed mineral areas for assessing sterilisation of resources and requesting landfill data to provide more detail on what has already been received to assess contamination potential.  BuCC responded with the data requested regarding minerals and waste sites, as well as links to the minerals safeguarding area (MSA) on the BuCC website.  BuCC confirmed it does not have a designated petroleum officer or hold any information on underground storage tanks (UST).
Environment Agency	Contact via email on:  24 April 2013; 15 May 2013; 24 May 2013; 12 June 2013; 14 June 2013; 27 June 2013; and 8 July 2013.	The Environment Agency has been contacted to supply information on landfills within the study area - data outstanding at the time of production of this report.

## 3 Detailed risk assessment

3.1.1 This appendix presents assessments for areas potentially posing a contaminative risk for the Proposed Scheme within the study area. For each site the following data are presented:

- baseline risk assessment;
- construction risk assessment;
- post-construction risk assessment; and
- assessment of temporary (construction) and permanent (post-construction) effects.

3.1.2 This risk assessment incorporates the following assumptions:

- construction workers are not included as part of this assessment;
- sites that have been assessed as potentially posing a contaminative risk to the Proposed Scheme have been grouped and considered together where appropriate. It should be noted that some parcels of land may have had several land uses from different epochs;
- during construction standard mitigation procedures will be in place in accordance with the draft Code of Construction Practice (CoCP) (Volume 5: Appendix CT-003-000); and
- during the post-construction condition it is assumed that all required remediation has been carried out and validated.

3.1.3 The sites assessed in this study area are shown on the Maps LQ-01-025 to LQ-01-028 (Volume 5 Land, Quality Map Book).

Table 2: Sites included in the detailed risk assessment within the Waddesdon and Quainton study area

Area reference	Area name	Table numbers
12-3	Aylesbury Link and disused railway spurs north-east of Oak Tree Farm and east of Upper South Farm	3, 6, 9, 12
12-4	Former Waddesdon sewage works	4, 7, 10, 13
12-11	Clay pits to south-east of Calvert landfill	5, 8, 11, 14

3.1.4 Contaminant types included within the risk assessments are based on the Priority Contaminants Report CLR 8<sup>1</sup>. Although withdrawn, this document is still commonly used and is considered good practice.

3.1.5 The remainder of this section presents the risk assessment for the sites set out in Table 2. The following acronyms are used in these tables:

<sup>1</sup> Defra and Environment Agency, (2002), *Potential contaminants for the assessment of land- R&D Publication*, Bristol, Environment Agency.

- CSM - conceptual site model;
- LWS - local wildlife site;
- SSSI - site of special scientific interest; and
- VOC - volatile organic compounds.

## 3.1 Baseline risk assessment

Table 3: Baseline CSM and qualitative risk assessment – Aylesbury Link and disused railway spurs north-east of Oak Tree Farm and east of Upper South Farm (Area ref 12-3)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Single track railway at grade and disused/dismantled railway  Residual contamination in made ground (e.g. ballast) including heavy metals, oils and asbestos. Low levels of ground gas (methane, carbon dioxide and VOC) in areas of potential landfilling  Potential for landfilling on disused railway spurs	Sensitive land use  Housing within 50m  Farm workers within 50m  Employees at Buckinghamshire railway centre and depot adjacent to existing line  Factory employees within 50m of existing line (adjacent to railway centre)	Inhalation/ingestion of or dermal contact with contaminated soils/dust  Inhalation of vapours derived from contaminated groundwater/soil  Exposure to asphyxiative or explosive gases	Low likelihood  Unlikely  Low likelihood	Moderate  Moderate  Severe	Moderate/low  Low  Moderate
	Controlled waters  Secondary A alluvium aquifer at surface crossing site where associated with un-named drain, Muxwell Brook and River Ray	Vertical and lateral migration of contaminated groundwater through culverts  Surface run-off	Unlikely  Low likelihood	Minor  Minor	Very low  Low
	Controlled waters  Muxwell Brook and River Ray	Lateral migration of contaminated groundwater through culverts  Surface run-off	Unlikely  Low likelihood	Minor  Minor	Very low  Low
	Ecological  Sheephause Wood SSSI  Grendon and Doddershall	Lateral migration of contaminated groundwater, through culverts and surface run-off	Low likelihood	Minor	Low

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
	Meadows LWS	Contact with windblown dusts	Unlikely	Minor	Very low
	Property Housing within 50m Buckinghamshire railway centre and depot adjacent to existing line Factory within 50m of existing line (adjacent to railway centre)	Lateral migration and concentration of asphyxiative or explosive gases	Low likelihood	Severe	Moderate
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 4: Baseline CSM and qualitative risk assessment – former Waddesdon sewage works (Area ref 12-4)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Heavy metals, organic compounds e.g. oils, pathogens from sludge which may have been spreading on surrounding land. Also methane, carbon dioxide and VOC if sludge was buried	Sensitive land use Adjacent housing (farm) Adjacent workers (farm)	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
		Exposure to asphyxiative or explosive gases	Low likelihood	Severe	Moderate
	Property Adjacent farm (housing and farm buildings)	Lateral migration and concentration of asphyxiative or explosive gases	Low likelihood	Severe	Moderate
		Direct contact of below ground building structures	Unlikely	Negligible	Very low

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
		and services with contaminated groundwater/soil			

Table 5: Baseline CSM and qualitative risk assessment – clay pits to south-east of Calvert landfill (Area ref 12-11)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Potential for some landfilling to have occurred given the proximity of the adjacent Calvert landfill which is a non-hazardous co-disposal site. Contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Controlled waters Muxwell Brook	Lateral migration of contaminated groundwater/leachate	Unlikely	Minor	Very low
		Surface run-off	Low likelihood	Minor	Low
	Controlled waters Secondary A alluvium aquifer at surface adjacent to site (associated with the un-named stream)	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Minor	Very low
		Surface run-off	Low likelihood	Minor	Low
	Ecological Sheephause Wood SSSI	Lateral migration of contaminated groundwater/leachate and surface run-off	Low likelihood	Minor	Low
		Contact with windblown dusts	Unlikely	Minor	Very low

## 3.2 Construction risk assessment

Table 6: Construction CSM and qualitative risk assessment – Aylesbury Link and disused railway spurs north-east of Oak Tree Farm and east of Upper South Farm (Area ref 12-3)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Single track railway at grade and disused/dismantled railway  Residual contamination in made ground (e.g. ballast) including heavy metals, oils and asbestos. Low levels of ground gas (methane, carbon dioxide and VOC) in areas of potential landfilling  Potential for landfilling on disused railway spurs	Sensitive land use  Housing within 50m  Farm workers within 50m  Employees at Buckinghamshire railway centre and depot adjacent to existing line	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
		Exposure to asphyxiative or explosive gases	Low likelihood	Severe	Moderate
	Controlled waters  Secondary A alluvium aquifer at surface crossing site where associated with un-named drain, Muxwell Brook and River Ray	Vertical and lateral migration of contaminated groundwater through culverts	Low likelihood	Minor	Low
		Surface run-off	Low likelihood	Minor	Low
	Controlled waters  Muxwell Brook and River Ray	Lateral migration of contaminated groundwater through culverts	Low likelihood	Minor	Low
		Surface run-off	Low likelihood	Minor	Low
	Ecological  Sheephause Wood SSSI  Grendon and Doddershall Meadows LWS	Lateral migration of contaminated groundwater, through culverts and surface run-off	Low likelihood	Minor	Low
		Contact with windblown	Low likelihood	Minor	Low

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
		dusts			
	Property Housing within 50m Buckinghamshire railway centre and depot adjacent to existing line Factory within 50m of existing line (adjacent to railway centre)	Lateral migration and concentration of asphyxiative or explosive gases	Low likelihood	Severe	Moderate
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 7: Construction CSM and qualitative risk assessment – former Waddesdon sewage works (Area ref 12-4)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Heavy metals, organic compounds e.g. oils, pathogens from sludge which may have been spreading on surrounding land. Also methane and carbon dioxide and VOC if sludge was buried	Sensitive land use Adjacent housing (farm) Adjacent workers (farm)	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
		Exposure to asphyxiative or explosive gases	Low likelihood	Severe	Moderate
	Property Adjacent farm (housing and farm buildings)	Lateral migration and concentration of asphyxiative or explosive gases	Low likelihood	Severe	Moderate
		Direct contact of below ground building structures and services with	Unlikely	Negligible	Very low

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
		contaminated groundwater/soil			

Table 8: Construction CSM and qualitative risk assessment – clay pits to south-east of Calvert landfill (Area ref 12-11)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Potential for some landfilling to have occurred given the proximity of the adjacent Calvert landfill which is a non-hazardous co-disposal site	Controlled waters Muxwell Brook	Lateral migration of contaminated groundwater/leachate	Low likelihood	Minor	Low
Contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, VOC and carbon dioxide)		Surface run-off	Likely	Minor	Moderate/low
	Controlled waters Secondary A alluvium aquifer adjacent to site (associated with the un-named stream)	Vertical and lateral migration of contaminated groundwater/leachate	Low likelihood	Minor	Low
		Surface run-off	Likely	Minor	Moderate/low
	Ecological Sheephause Wood SSSI	Lateral migration of contaminated groundwater/leachate and surface run-off	Likely	Minor	Moderate/low
		Contact with windblown dusts	Low likelihood	Minor	Low

### 3.3 Post-construction risk assessment

Table 9: Post-Construction CSM and qualitative risk assessment – Aylesbury Link and disused railway spurs north-east of Oak Tree Farm and east of Upper South Farm (Area ref 12-3)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Single track railway at grade and disused/dismantled railway	Sensitive land use Housing within 50m Farm workers within 50m	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Unlikely	Moderate	Low
Residual contamination in made ground (e.g. ballast) including heavy metals, oils and asbestos. Low levels of ground gas (methane, carbon dioxide and VOC) in areas of potential landfilling	Employees at Buckinghamshire railway centre and depot adjacent to existing line	Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
Potential for landfilling on disused railway spurs	Factory employees within 50m of existing line (adjacent to railway centre)	Exposure to asphyxiative or explosive gases	Low likelihood	Severe	Moderate
	Controlled waters Secondary A alluvium aquifer at surface crossing site where associated with un-named drain, Muxwell Brook and River Ray	Vertical and lateral migration of contaminated groundwater through culverts	Unlikely	Minor	Very Low
		Surface run-off	Unlikely	Minor	Very Low
	Controlled waters Muxwell Brook and River Ray	Lateral migration of contaminated groundwater through culverts	Unlikely	Minor	Very Low
		Surface run-off	Unlikely	Minor	Very Low
	Ecological Sheephause Wood SSSI Grendon and Doddershall	Lateral migration of contaminated groundwater, through culverts and surface run-off	Unlikely	Minor	Very Low

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
	Meadows LWS	Contact with windblown dusts	Unlikely	Minor	Very low
	Property Housing within 50m Buckinghamshire railway centre and depot adjacent to existing line Factory within 50m of existing line (adjacent to railway centre)	Lateral migration and concentration of asphyxiative or explosive gases	Low likelihood	Severe	Moderate
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 10: Post-Construction CSM and qualitative risk assessment – former Waddesdon sewage works (Area ref 12-4)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Heavy metals, organic compounds e.g. oils, pathogens from sludge which may have been spreading on surrounding land. Also methane and carbon dioxide and VOC if sludge was buried	Sensitive land use Adjacent housing (farm) Adjacent workers (farm)	Inhalation/ingestion of or dermal contact with contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
		Exposure to asphyxiative or explosive gases	Low likelihood	Severe	Moderate
	Property Adjacent farm (housing and farm)	Lateral migration and concentration of asphyxiative or explosive	Low likelihood	Severe	Moderate

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
	buildings)	gases			
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 11: Post-Construction CSM and qualitative risk assessment – clay pits to south-east of Calvert landfill (Area ref 12-11)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Potential for some landfilling to have occurred given the proximity of the adjacent Calvert landfill which is a non-hazardous co-disposal site  Contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Controlled waters  Muxwell Brook	Lateral migration of contaminated groundwater/leachate	Unlikely	Minor	Very low
		Surface run-off	Low likelihood	Minor	Low
	Controlled waters  Secondary A alluvium aquifer adjacent to site (associated with the un-named stream)	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Minor	Very low
		Surface run-off	Low likelihood	Minor	Low
	Ecological  Sheephause Wood SSSI	Lateral migration of contaminated groundwater/leachate and surface run-off	Low likelihood	Minor	Low
		Contact with windblown dusts	Unlikely	Minor	Very low

## 3.4 Assessment of temporary (construction) and permanent (post-construction) effects

Table 12: Significance of impact during construction and post construction – Aylesbury Link and disused railway spurs north-east of Oak Tree Farm and east of Upper South Farm (Area ref 12-3)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction effects	Post-construction effects
Inhalation/ingestion/dermal contact of contaminated soils/dusts by adjacent residents (farm) and commercial employees within 50m	Moderate/low	Moderate/low	Low	Negligible	Minor beneficial effect
Inhalation of vapours derived from contaminated groundwater/soil by adjacent residents (farm) and commercial employees within 50m	Low	Low	Low	Negligible	Negligible
Exposure to asphyxiative or explosive gases by adjacent residents (farm) and commercial employees within 50m	Moderate	Moderate	Moderate	Negligible	Negligible
Vertical and lateral migration of contaminated groundwater into the Secondary A alluvium aquifer at surface	Very low	Low	Very low	Minor adverse effect	Negligible
Surface run-off into Secondary A alluvium aquifer at surface	Low	Low	Very low	Negligible	Minor beneficial effect
Lateral migration of contaminated groundwater into the River Ray and Muxwell Brook at surface	Very low	Low	Very low	Minor adverse effect	Negligible
Surface run-off into River Ray and Muxwell Brook	Low	Low	Very low	Negligible	Minor beneficial effect
Lateral migration of contaminated groundwater and surface run-off into Sheephause Wood SSSI	Low	Low	Very Low	Negligible	Minor beneficial effect
Contact with windblown dusts in Sheephause Wood SSSI	Very low	Low	Very low	Minor adverse effect	Negligible
Lateral migration and concentration of	Moderate	Moderate	Moderate	Negligible	Negligible

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction effects	Post-construction effects
asphyxiative or explosive gases in adjacent building structures					
Direct contact of below ground building structures and services within 50m with contaminated groundwater/soil	Very low	Very low	Very low	Negligible	Negligible
Overall significance				Minor adverse effect	Negligible

Table 13: Significance of impact during construction and post construction – former Waddesdon sewage works (Area ref 12-4)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction effects	Post-construction effects
Inhalation/ingestion/dermal contact of contaminated soils/dusts by adjacent residents and workers (farm)	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Inhalation of vapours derived from contaminated groundwater/soil by adjacent residents and workers (farm)	Low	Low	Low	Negligible	Negligible
Exposure to asphyxiative or explosive gases by adjacent residents and workers (farm)	Moderate	Moderate	Moderate	Negligible	Negligible
Lateral migration and concentration of asphyxiative or explosive gases in adjacent building structures	Moderate	Moderate	Moderate	Negligible	Negligible
Direct contact of below ground building structures and services on-site (farm) with contaminated groundwater/soil	Very low	Very low	Very low	Negligible	Negligible
Overall significance				Negligible	Negligible

Table 14: Significance of impact during construction and post construction – clay pits to south-east of Calvert landfill (Area ref 12-11)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction effects	Post-construction effects
Lateral migration of contaminated groundwater/leachate into the Muxwell Brook	Very low	Low	Very low	Minor adverse effect	Negligible
Surface run-off into Muxwell Brook	Low	Moderate/low	Low	Minor adverse effect	Negligible
Vertical and lateral migration of contaminated groundwater/leachate into the Secondary A alluvium aquifer at surface	Very low	Low	Very low	Minor adverse effect	Negligible
Surface run-off into Secondary A alluvium aquifer at surface	Low	Moderate/low	Low	Minor adverse effect	Negligible
Lateral migration of contaminated groundwater/leachate and surface run-off into Sheephause Wood SSSI	Low	Moderate/low	Low	Minor adverse effect	Negligible
Contact with windblown dusts in Sheephause Wood SSSI	Very low	Low	Very low	Minor adverse effect	Negligible
Overall significance				Minor adverse effect	Negligible

## 4 Inspections notes and other site data

4.1.1 There were no site visits carried out due to access constraints and no additional site data have been identified.

## 5 Geological site of special scientific interest and local geological sites

5.1.1 There are no geo-conservation resources identified within the study area.

## 6 Mining and minerals data

- 6.1.1 The Buckinghamshire Minerals and Waste Core Strategy development plan document<sup>2</sup>, confirms that the route will not pass through any MSA, mineral consultation areas or sites of current extraction.
- 6.1.2 There are no known mining or quarrying activities within the study area.

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<sup>2</sup> Buckinghamshire County Council (2011), *Minerals and Waste Core Strategy*, Adopted November 2012.

## 7 References

Buckinghamshire County Council, (2011), *Minerals and Waste Core Strategy*, Adopted November 2012.

Defra and Environment Agency, (2002), *Potential contaminants for the assessment of land - R&D Publication*, Bristol, Environment Agency.